(12) UK Patent Application (19) GB (11) 2 342 983 (13) A

(43) Date of A Publication 26.04.2000

(21) Application No 0002407.5

(22) Date of Filing 24.12.1996

Date Lodged 02.02.2000

(30) Priority Data
(31) 19601165 (32) 15.01.1996 (33) DE

(62) Divided from Application No 9626868.5 under Section 15(4) of the Patents Act 1977

(51) INT CL[7]
F41H 11/02 , G01S 7/38 7/495

(52) UK CL (Edition R)
F3C CAJ
H4D DSC D458 D467
U1S S1197 S1839

(56) Documents Cited
GB 2296078 A EP 0199447 A2

(58) Field of Search
UK CL (Edition R) F3C CAJ , H4D DSC
INT CL[7] F41H , G01S
ONLINE: EPODOC, JAPIO, WPI

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(54) Abstract Title
Counter-measure system for aircraft

(57) Warning instruments (10) are provided in the aircraft, which respond to a threat by a guided missile. Furthermore, a processor (16) is provided in the aircraft, the signals from the warning instruments (10) being applied to the processor, the processor being programmed to recognize the kind of the threat and to select counter measures. The aircraft has a dispenser (20) which contains both steerable and programmable decoy bodies and non-steerable decoy bodies. Depending on the kind of the threat, the processor selects one type of decoy body. A steerable and programmable decoy body (30) is programmed by the aircraft-side processor (16) in accordance with the determined threat.

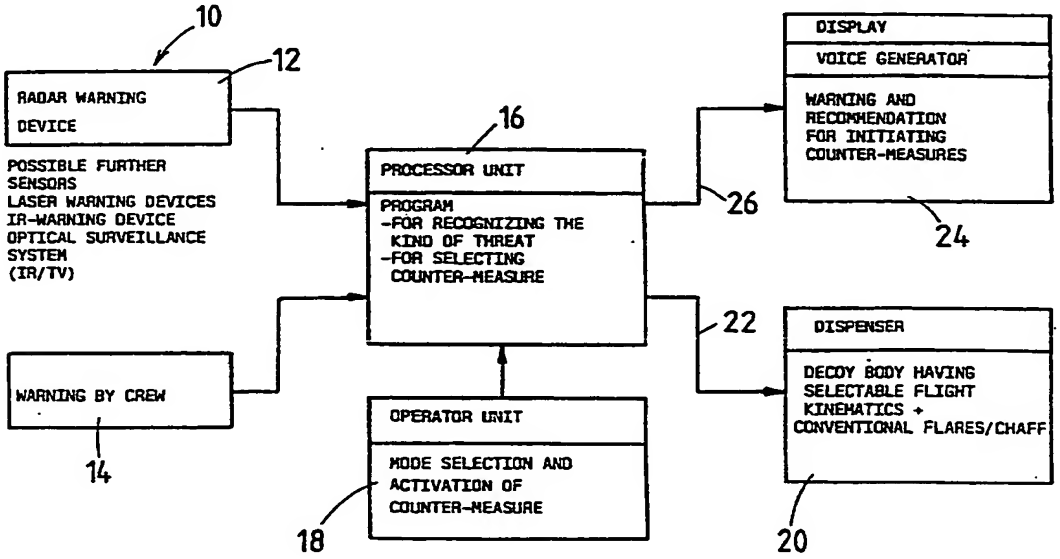

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Fig. 1

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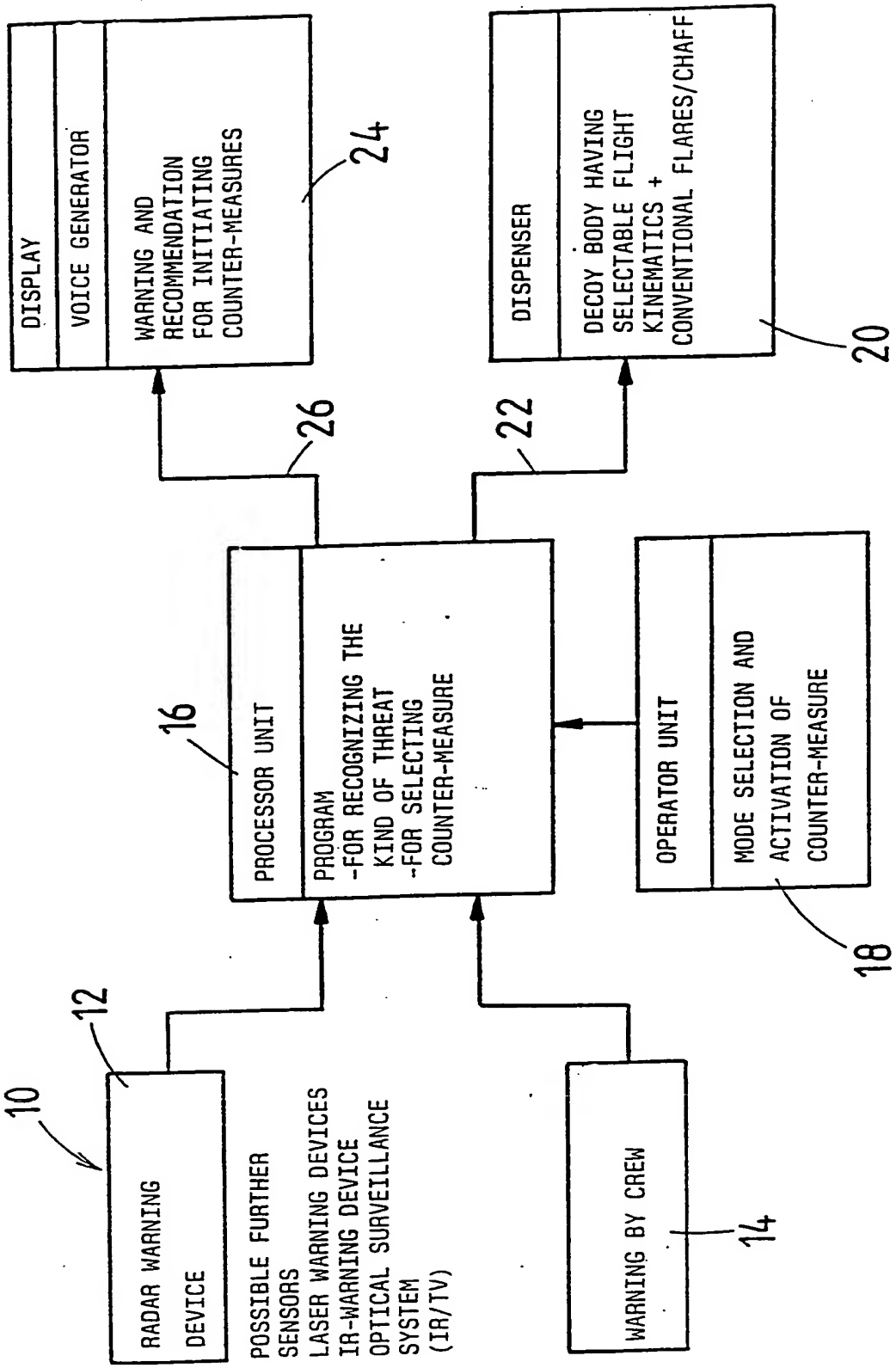
10
12
RADAR WARNING DEVICE
POSSIBLE FURTHER SENSORS
LASER WARNING DEVICES
IR-WARNING DEVICE
OPTICAL SURVEILLANCE SYSTEM (IR/TV)
14
WARNING BY CREW
16
PROCESSOR UNIT
PROGRAM
-FOR RECOGNIZING THE KIND OF THREAT
-FOR SELECTING COUNTER-MEASURE
18
OPERATOR UNIT
MODE SELECTION AND ACTIVATION OF COUNTER-MEASURE
20
DISPENSER
DECOY BODY HAVING SELECTABLE FLIGHT KINEMATICS + CONVENTIONAL FLARES/CHAFF
22
26
24
DISPLAY
VOICE GENERATOR
WARNING AND RECOMMENDATION FOR INITIATING COUNTER-MEASURES

Fig. 1

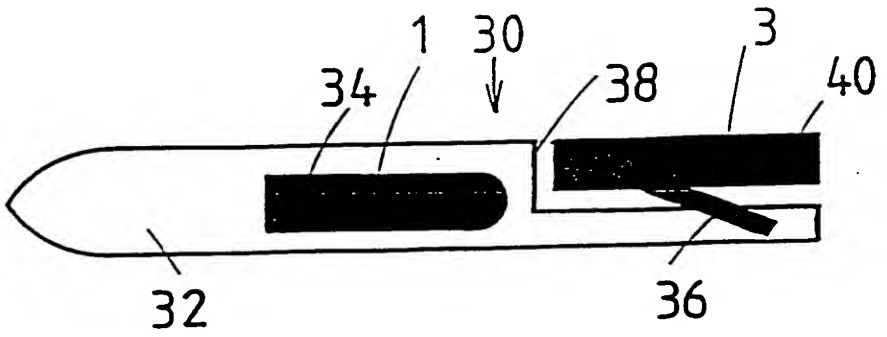

Fig. 2

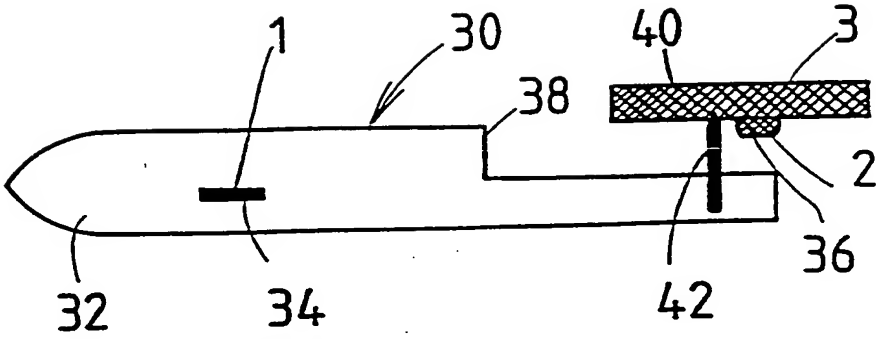

Fig. 3

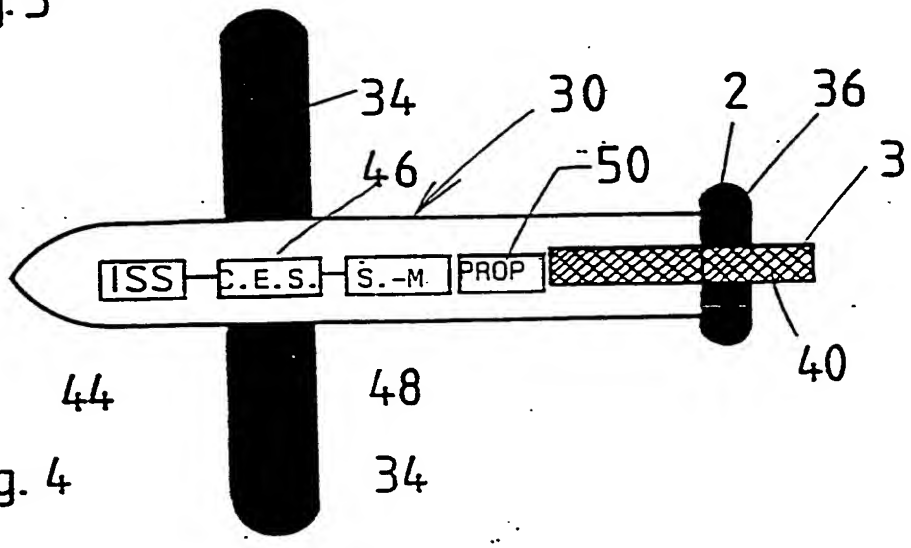

Fig. 4

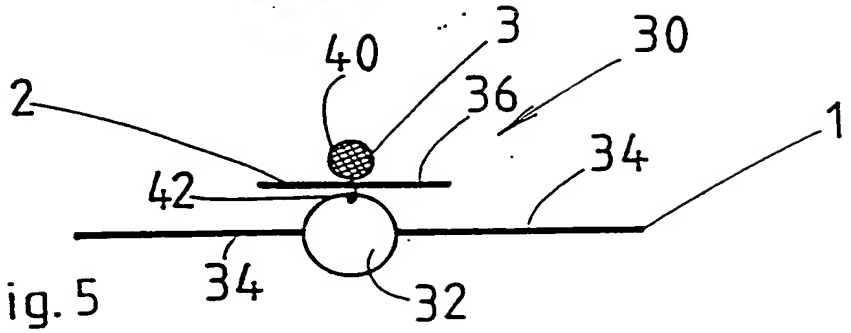

Fig. 5

DECOY BODY FOR DEVIATING TARGET-TRACKING MISSILES.

The invention relates to a decoy body, which ist designed to be expelled from an aircraft, in order to serve as a dummy target for deviating a target tracking missile provided with a seeker head from the aircraft.

Target-tracking guided missiles are known, which are guided to a target by a seeker head operating with RADAR or by a seeker head responding to infrared radiation. With air-to-air guided missiles, the target is an aircraft. An aircraft attacked by such a guided missile has no chance of survival, if it does not take counter-measures. Conventional counter-measures consist in expelling a decoy body which represents a dummy target and directs the guided missile to itsels and, thereby, deviates the guided missile from the aircraft. Decoy bodies which are provided with a pyrotechnic IR-emitter, which emits intense IR-radiation, (flares) serve as counter-measures against a guided missile with a seeker head responding to infrared radiation. The decoy bodies are usually dropped by the aircraft with a fixed speed.

Measures at the target-tracking guided missiles, in turn, are known, which serve to recognize decoy bodies such that these decoy bodies are disregarded during the target tracking. Thereby, the counter-measures of the aircraft are overcome.

It is the object of the invention to improve the efficieny of decoy bodies.

According to the invention, this object is achieved in that the decoy body is steeerable and arranged to be programmed depending on the kind of the threat.

In this way, the decoy body can be programmed an can be guided such relative to the aircraft tha the seeker head of the guided missile, on one hand, is not able to recognize the decoy body as but, on the other hand, is directed towards the decoy body and away from the aircraft.

The the decoy body may contain a steering system, which is controlled by an inertial sensor system through a controlling electronic system and servomotors in accordance with the programming. The inertial sensor system can be of very simple construction, as it operates for a short time only, and no high accuracy is required. The steering system of the decoy body may comprise wings and an elevator unit. The wings and the elevator may, at first, be accommodated within the structure of the decoy body and may be automatically swung out, after the decoy body has been expelled. A pyrotechnic IR-emitter may be mounted on the elevator, in order to deviate guided missiles wit a seeker head responding to infrared radiation and may be also accommodated within the structure prior to the expelling.

Another way of steering the decoy body consists in that linear momentum generators are provided at the structure of the decoy body.

The decoy body may be without propulsion or may be provided with propulsion of its own.

The invention relates also to a counter-measure system for deviating approaching, target tracking, guided missiles which operates with decoy bodies of the type mentioned

above. In this counter-measure system warning instruments are provided in the aircraft, which respond to a threat by a guided missile. Furthermore, a processor is provided in the aircraft, signals from the warning instruments (10) being applied to this processor, the processor being programmed to recognize the kind of the threat and to select counter-measures.

The aircraft may be provided with a dispenser, which contains both steerable and programmable decoy bodys of the type described above and non-steerable decoy bodys. The processor selects one type of decoy body depending on the kind of the threat. The processor may be arranged to automatically initiate the expelling of the selected decoy body. It is, however, also possible that an indicating device connected with the processor is provided in the aircraft, this indicating device serving to transmit a recommendation for initiating a counter-measure to the crew of the aircraft. The indicating device may be a voice generator.

A steerable and programmable decoy body may be programmable by the aircraft-side processor (16) depending on the detected threat.

The invention permits the crew of the attacked aircraft to react to a threat in optimal way adapted to the kind of the threat.

An embodiment of the invention is described in greater detail with reference to the accompanying drawings.

Fig.1 is a block diagram of a counter-measure system which reacts to the threat by a target-tracking guided missile by expelling decoy bodies.

Fig.2 shows a schematic side elevation of a steerable and programmable decoy body in its collapsed state of rest.

Fig.3 shows a side elevation of the decoy body similar to Fig.2 in its operative state.

Fig.4 is a plan view of the decoy body of Fig.3.

Fig.5 is a front view of the decoy body of Fig,3.

Fig.1 is a block diagram and illustrates the set-up of a counter-measure system of an aircraft, which system reacts to a threat of the aircraft by a target-tracking guided missile. Sensors 10 are provided at the aircraft, which provide information about such a threat. The sensors comprise a radar warning device 12. Further sensors are a laser warning device, an IR-warning device and an optical surveillance system. The optical surveillance system is an image resolving sensor operating in the infrared wavelength range similar to a video camera. It is also possible to enter a warning signal by the crew of the aircraft. This is illustrated by block 14.

The data from the sensors 10 including the warning signal inputted by the crew are applied to a processor 16. The processor 16 is programmed to recognize the kind of the threat from the data of the sensors 10 and to select an appropriate counter-measure.

Furthermore, the processor 16 is connected with an operator unit 18. By means of this operator unit, the crew is in the position to manually select and activate a certain kind of counter-measure (mode).

Different types of decoy bodies are arranged in a dispenser 20: conventional "flares" without control nor propulsion, "chaff" and decoy bodies which are steerable and programmable. One type of decoy body depending on the kind of threat can be selected by the processor 16. The dispenser 20 is then actuated through the connection 22 such that this type of decoy body is expelled. When the processor 16 selects a steerable and programmable decoy body, this decoy body will be programmed according to the kind of threat in such a way, that, after it has been expelled, it exhibits a desired flight behaviour, for example moves away from the aircraft in the direction towards the attacking guided missile the location of which has been detected by the sensors.

At the same time, the processor 16 provides a warning of the threat and a recommendation for counter-measures to be taken at an indicating device 24. This is illustrated by connection 26 in Fig.1. The indicating device may be a display on which the warning and recommendation is displayed visually. The indicating device may, however, also comprise a voice generator, which provides the warning and recommendation acoustically.

Eventually, the processor 16 may directly trigger the expulsion of the selected and, if applicable, programmed decoy body in accordance with the kind of threat determined by the processor and correspondingly the counter-measure selected by the processor. In another mode of operation, the processor may confine itself to render a warning and recommendation through the indicating device 24. The the crew of the aircraft selects and activates the counter-measure manually through the operator unit 18. This counter-measure thus selected manually may follow the

recommendation given. The crew may, however, also deviate from the recommendation for particular reasons.

Fig.2 shows a steerable and programmable decoy body 30. In Fig.2, the decoy body 30 is illustrated in its collapsed state. The decoy body 30 is held in the dispenser 20 in this state. The decoy body 30 has a structure 32. In the state illustrated in Fig.2, wings 34 and an elevator 36 are collapsed in recesses such as 38 of the structure 34. A pyrotechnic IR-emitter in the form of a cartridge is mounted on the elevator. In the collapsed state, the IR-emitter 38 is also accommodated in the recess 38 of the structure 34.

In Figs.3 to 5, the decoy body is illustrated in "put up" state.

The decoy body has a pair of opposite, aligned wings 34, in its front section, and an elevator 36. A cartridge, which forms a pyrotechnic IR-emitter 40 is mounted on the elevator 36. The cartridge is held on a expansible support 42.

As indicated by Fig.4, the structure 32 of the decoy body 30 contains a simple inertial sensor system 44 and a controlling electronic system 46. The controlling electronic system 46 is connected with the inertial sensor system 44, and receives attitude and/or angular rate signals. Prior to the expulsion of the decoy body 30, the controlling electronic system is programmed by the processor 16 such that the decoy body exhibits a desired flight behaviour, thus,for example, flies in a desired direction. The controlling electronic system energizes servomotors 48, which actuate the control surfaces of the decoy body 30 in the way required.

The decoy body 30 has a propulsion engine 50 of its own. The decoy body may, however, also be without propulsion.

The decoy body has a high back-scattering cross section for deceiving attacking guided missiles with active seeker heads, for example with seeker heads which operate with RADAR or lasers.

Claims:

1. A counter-measure system for deviating approaching, target tracking, guided missiles comprising

(a) warning instruments provided in the aircraft, which respond to a threat by a guided missile, and

(b) a processor provided in the aircraft, and arranged such that signals from the warning instruments (10) are applied to this processor, the processor being programmed to recognize the kind of the threat and to select counter-measures.

2. A counter-measure system as claimed in claim 1, wherein

(a) the aircraft is provided with a dispenser, which contains both steerable and programmable decoy bodies, each such decoy body being steerable and arranged to be programmed depending upon the kind of threat, and non-steerable decoy bodies, and

(b) the processor (16) selects one type of decoy body depending on the kind of the threat.

3. A counter-measure system as claimed in claim 2, wherein each decoy body contains a steering system, which is controlled by an inertial sensor

system through a controlling electronic system and servomotors in accordance with the programming.

4. A counter-measure system as claimed in claim 3, wherein the steering system of the decoy body comprises wings and an elevator unit.

5. A counter-measure system as claimed in claim 4, wherein the wings and the elevator are, at first, accommodated within the structure of the decoy body and are automatically swung out, after the decoy body has been expelled.

6. A counter-measure system as claimed in claim 5, wherein a pyrotechnic IR-emitter is mounted on the elevator is also accommodated within the structure prior to the expelling.

7. A counter-measure system as claimed in claim 2, wherein linear momentum generators are provided at the structure of the decoy body to permit steering of the decoy body.

8. A counter-measure system as claimed in any one of claims 2 to 7, wherein each decoy body is without propulsion.

9. A counter-measure system as claimed in any of claim 2 to 7, wherein each decoy body is provided with propulsion of its own.

10. A counter-measure system as claimed in any one of claims 2 to 9, wherein the processor is arranged to automatically initiate the expelling of the selected decoy body.

11. A counter-measure system as claimed in any one of claims 2 to 9, wherein an indicating device connected with the processor is provided in the aircraft, this indicating device serving to transmit a recommendation for initiating a counter-measure to the crew of the aircraft.

12. A counter-measure system as claimed in claim 11, wherein the indicating device is a voice generator.

13. A counter-measure system as claimed in any one of claims 2 to 12, wherein each steerable and programmable decoy body is programmable by the aircraft-side processor depending on the detected threat.

14. A counter-measure system substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

The Patent Office

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Application No: GB 0002407.5 **Examiner:** Trevor Berry
Claims searched: 1 to 14 **Date of search:** 18 February 2000

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): F3C (CAJ); H4D (DSC)

Int Cl (Ed.7): F41H, G01S

Other: ONLINE: EPODOC, JAPIO, WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
P, X	GB 2296078 A	DAIMLER-BENZ- note page 11 lines 3 to 13	1
X	EP 0199447 A2	SPECTRONIX-note page 11 lines 15 to 20	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
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